

REMARKS

This paper is filed in response to the official action dated March 13, 2009 (the official action).

All pending claims 1, 4, 7, 10, 13, 14, 17, 23, 27, 28, and 30-33 have been variously rejected as obvious over U.S. Patent 6,424,326 to Yamazaki ("Yamakazi") in view of U.S. Patent No. 5,594,463 to Sakamoto ("Sakamoto"), Japanese Patent No. JP-2000-132133 ("Tomita") and applicants' assertedly admitted prior art ("AAPA"). Applicant respectfully traverses the rejections.

Claims 32 and 33 have been canceled, without prejudice, by amendment above. Applicant therefore addresses their remarks primarily to independent claims 1 and 17.

I. CLAIMS 1, 4, 7, 10, 13, 14, 17, 23, 27, 28, 30, AND 31

To establish a *prima facie* case of obviousness, the examiner must show that all the elements of the claim are taught or suggested in the prior art (MPEP 2143.03 and Federal Register Examination Guidelines for Determining Obviousness, Section III.A.1, Fed Reg., Vol 72, No. 195, 2007), and if prior art elements are described in the art, the combination of elements must yield predictable results to render a claimed invention obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.* affirmed that a sufficient showing of obviousness must be made, and that "the key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious." Federal Register, Vol. 72, No. 195, Wednesday, October 10, 2007, Notices, page 57528 (courtesy copy attached). The Supreme Court, quoting *In re Kahn*, admonished that "rejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR*, 550 U.S. at 1, 82 USPQ2d at 1396.

The office action fails to show where all the elements of the claims are taught or suggested in the prior art. As such, the obviousness rejections are traversed and reconsideration is respectfully requested.

Both claims 1 and 17 recite a display driver having **(A)** a plurality of pixels each having a pixel driver circuit that includes a drive field effect transistor (FET), and **(B)** a

plurality of adjustable constant current generators each for driving a row or column of the display with an adjustable constant current determining the voltage on the gate connection of the pixel driver circuit, i.e., the gate connection of the drive FET.

The Examiner asserts that drive field effect transistor (131) of Yamazaki is both the FET contained in each pixel driver circuit and the adjustable constant current generator driving a row/column of the display. That is not and cannot be the case.

In Yamazaki, the drive transistor (131) is part of the pixel driver circuit, but that driver circuit does not have a plurality of adjustable constant current generators each for driving a row/column of the display. In particular, the claims provide that each constant current generator **determines the voltage on the gate connection** of the drive FET. In the illustrated examples of the present application, the plurality of adjustable constant current generators are different than the driver circuit FETs. In the office action's rejection of claim 1, they are one and the same. Yet, the drive transistor (131) in Yamazaki certainly cannot be said to drive a row/column of the display as an adjustable constant current that determines the voltage on **its own** gate connection. To the contrary, the drive transistor (131) does not operate as both a driver FET and a means to set the voltage on the gate connection of that driver FET. In this way, the characterization of Yamazaki as teaching at least these elements is traversed. And for this reason alone, the rejections of independent claims 1 and 17 cannot be sustained, as neither Yamazaki, nor Sakamoto, nor any of the other art of record can be said to teach the recited subject matter.

Moving on, however, the office action also asserts that the light receiving diode 136 of Yamazaki discloses a current sensor to sense a current on the gate connection. It is respectfully submitted that this does not make sense electrically-speaking. The gate connection of a FET is essentially an insulator and substantially no current flows into or out of the gate connection. The FET is a voltage-controlled device. The diode 136 in Yamazaki senses the brightness of EL element 132.

Moreover, claim 1 recites "a voltage sensor to sense a said voltage on a said gate connection." The office action acknowledges that "Yamazaki does not explicitly disclose a voltage sensor to sense the voltage on the gate connection" (see, office action, page 5). Beyond this though, one of ordinary skill would not be motivated to use a voltage sensor in Yamazaki because the voltage on the gate connection of drive transistor (131) is a binary voltage, which is either on or off. See, e.g., column 9, lines 36-48 and Figure 5 –

noting that it is the digital video signal on line S which is applied to the gate of transistor (131) via switching transistor (130)). One would not be motivated to modify Yamazaki to include a voltage sensor, as recited in the claims, for use the Yamazaki configuration. Furthermore, the office action has pointed to no other rationale for combining a voltage sensor with the teachings of Yamazaki for other purposes.

Applicant recognizes that the office action cites to Sakamoto. However, there are key conceptual differences between the systems of Sakamoto and Yamazaki which suggest, if not demonstrate, that one of ordinary skill would not be motivated to combine the teachings of the two. First, Sakamoto does not describe an active matrix electroluminescent display. While it is true that each pixel may be driven by driver circuit (32) (see, e.g., Figure 6) having a constant current source, the individual pixels do not contain pixel driver circuits. Sakamoto, for example, does not have a driver circuit that includes an FET. That Yamazaki and Sakamoto describe different display control configuration was acknowledged by the office action (see, page 7) — however, the import of their differences may not have been fully appreciated.

In combining Yamazaki and Sakamoto, the Examiner asserts that “Yamazaki and Sakamoto both disclose a means of driving an electroluminescent display by controlling an adjustable power supply to an adjustable constant current generator.” At paragraph 19 (page 20), the Examiner characterizes applicant’s last response as arguing “that neither Yamazaki nor Sakamoto disclose a current driven display wherein a power controller controls a voltage supply to a constant current generator.” It is respectfully submitted that this is not in fact precisely what was being discussed by the applicant.

If one accepts, for the sake of argument and not by way of admission, the Examiner’s assertion that drive transistor (131) of Yamazaki functions as an adjustable constant current generator then the Examiner’s position that both Yamazaki and Sakamoto disclose a means of driving an electroluminescent display by controlling an adjustable power supply to an adjustable constant current generator would be considered. However, this is not what is claimed by the applicant.

It may be helpful to consider examples from the specification to further flush out the differences, before detailing further the differences with the claims. The display of the present application has active matrix pixels including drive FETs. Separate, adjustable constant current generators program the brightness of these pixels. In the active matrix

circuit, this results in a voltage on the gate of the drive FET (notably, this voltage is not defined; it is the current which is defined). This gate voltage is different for different pixels (1) because the programming constant current is adjustable for an adjustable brightness, and (2) because a constant current generator allows the voltage to vary in whatever way it needs to achieve the defined constant current. The gate voltage is sensed and the power controller adjusts the voltage to the adjustable constant current generators, where that adjustment is dependent upon the (variable) gate voltage of the drive FET. That is, a voltage in part of an active matrix pixel circuit is monitored (in dependent claim 4 via an electrode of the display) and used to regulate a voltage supply to the adjustable constant current generators programming the active matrix pixels.

In developing such a system, the inventors addressed a particular problem: how to reduce power consumption in a current-programmed active matrix display, e.g., a display in which each pixel has an associated pixel driver circuit in which the brightness of the pixel is programmed by an adjustable constant current applied to that pixel driver circuit. Current programmed active matrix displays are limited because of the nature of a constant current generator. In particular, with a constant current generator the current is constant and the output voltage of the constant current generator can vary freely depending upon the load. In active matrix displays in which the brightness of a pixel is defined by the constant current (rather than voltage) this creates a problem because the voltages within the circuit, in particular the gate voltage on the drive FET, can vary without the brightness of the pixel changing. Whereas, the gate voltage of the drive FET in a current programmed active matrix pixel circuit will vary depending upon the brightness of the pixel, as well as transistor characteristics, operating point, temperature and other circuit parameters.

This problem does not arise in Sakamoto, which describes a passive matrix display, nor does it arise in Yamazaki in which the active matrix pixels are voltage-programmed rather than current-programmed. The Yamazaki pixel driver circuit is the like that shown in Figure 1b of the present application, described as a prior art voltage-programmed circuit.

Returning to the claimed subject matter and the art rejection, the office action asserts the following rationale for why the ordinary designer would have combined the teachings of Yamasaki and Sakamoto: "the voltage sensor disclosed by Sakamoto can be applied to sense the voltage on the gate connection disclosed by Yamazaki, as the gate

connection determines the driving voltage.” This rationale is incorrect. The Examiner asserts that the driving transistor (131) functions as an adjustable constant current generator, in which case the gate connection cannot determine the driving voltage to the OLED, since in a current generator it is the current which is programmed and the voltage which is allowed to vary and hence cannot be determined. If the Examiner is referring to the voltage driving the gate connection, then it is respectfully submitted that it would be pointless to sense the voltage on the gate connection of the drive transistor (131) since Yamazaki is designed such that already known digital video signals are fed to the gate electrode of (see, for example, Yamazaki column 9 lines 59-63). As a voltage-driven active matrix pixel circuit, the voltage driving the pixel and determining pixel brightness is pre-defined, meaning there would be no purpose in sensing and measuring it.

At pages 21 and 22, the Examiner argues that the incompatibility between Yamazaki and Sakamoto seems to be at odds with the applicants own disclosure. This is not true. At a base level, the reason why the disclosures of Sakamoto and Yamazaki are incompatible is that if one attempted to use the constant current generators 10, 88 of Sakamoto to control the brightness of the voltage-controlled active matrix pixels of Yamazaki the purported combination would not work for any identified intended purpose. The office action has provided no rationale by which the person of ordinary skill in the art would be so motivated; instead the two references suggest against combination of their teachings. This is because the active matrix pixels of Yamazaki are designed to have the brightness of EL elements 132 determined by a voltage on the signal line S whereas the constant current generators of Sakamoto are designed to apply a constant current, where constant current generators are designed to allow their output voltages to vary (in order to maintain a constant output current). This is especially the case if an adjustable constant current were being used to attempt to control the brightness of a pixel/display element by controlling the current.

In noting that this seems to be at odds with the applicant's own disclosure, the Examiner refers to applicant's Figure 7. The reliance on Figure 7 is misplaced, as that figure does not illustrate a detailed active matrix pixel circuit (these are shown, instead in Figures 2a, 3 and 4), but rather a conceptual circuit diagram (and is described as such in the specification, for example at the bottom of page 21). In this circuit diagram the details of the circuits of Figures 2a, 3 and 4 have been abstracted away to leave the control arrangement. In an actual active matrix pixel circuit, detailed components would likely also be present, as

shown, for example, in Figures 2a, 3 and 4. It is recognized that the Examiner may have been misled by the over-simplification of the circuit within the dashed box 640 illustrating an active matrix pixel. The complete circuit of a current-programmed active-matrix pixel includes a number of additional components. In any event, as outlined above, it should now be appreciated that even the concepts generally illustrated in Figures 7a and 7b are not present in any of the cited prior art documents.

Addressing the other art of record briefly, regarding Tomita, it is noted that the Examiner does not assert that Tomita discloses sensing of any sort, either voltage or current. The Examiner relies on Tomita to support a combination of Sakamoto and Yamazaki by noting that Tomita discloses a constant current generator associated with an active matrix display. Although Tomita shows current supplied to EL drive circuits 15a....n from a constant current generator 12, the constant current generator 12 is in effect being used as an overall power supply to the EL elements, similar to circuit 82 of Sakamoto; it is not being used to control individual pixel brightness, as would suggested by the Examiner.

It remains the case that were the display 101 of Yamazaki to be used in place of the display panel 30 of Sakamoto, the arrangement would not function for its intended purpose or any other purpose established by the office action. Judging from the abstract, constant current controller 12 of Tomita appears to be providing overall brightness control. Whilst a circuit which supplies current, and therefore electrical power, is able to provide a power supply for a display, this is not what the applicant claims – what is claimed is instead adjustable constant current generators driving rows/columns of a display to control the display elements (pixel) brightness using the adjustable constant currents, the adjustable constant currents driving active matrix pixel circuits as recited in the claims. Whilst it may be possible to use a constant current generator 12 of Tomita as a power supply to supply power to power supply line V of the Yamazaki active matrix pixel, such an arrangement still would not teach, suggest, or motivate the claimed subject matter.

It is further noted that, contrary to the Examiner's assertion, Tomita does not in fact disclose an active matrix in line matrix display. The representative figure accompanying the abstract shows a line of display elements each having a separate connection, of a type which would be impractical in a matrix. This is relevant because a different type of pixel circuit would be required in a matrix-type display if one were to use row and column electrodes rather than a separate connection to each pixel. Thus, even if

Tomita were to be considered to disclose active pixels, although it might be possible to use the constant current generator 88 of Sakamoto in place of the constant current controller 12 of Tomita (or vice versa) this does not demonstrate that the voltage-controlled active matrix pixel circuit of Yamazaki is compatible with Tomita or Sakamoto. And either way, as previously explained, this would not result in the claimed subject matter.

The applicants note that a proper analysis for obviousness requires that "[T]he scope and content of the prior art are ... determined; differences between the prior art and the claims at issue are ... ascertained; and the level of ordinary skill in the pertinent art resolved." *Graham v. John Deere Co. of Kansas City*, 383 U. S. 1. Thus, the analysis must include a discussion of the prior art on which the examiner is relying. Just as the examiner has addressed the references individually in setting out the rejection, the applicants offer in rebuttal a discussion of what the individual references disclose. This rebuttal discussion cannot be construed as an attack on the references individually; it is simply a discussion of what the individual references disclose so as to ascertain whether the combined teachings support the examiner's assertion of obviousness. The teachings as a whole cannot be deduced without an understanding of the individual teachings.

It is incumbent upon the examiner to establish *prima facie* obviousness by a clear showing, and that has not occurred.

II. CONCLUSION

All of the pending claims (claims 1, 4, 7, 10, 13, 14, 17, 23, 27, 28, 30, AND 31) are in condition for allowance. A prompt indication of allowability is earnestly solicited.

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